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1 [Paper session DB-8 \(databases\): query optimisation: Towards estimating the number of distinct value combinations for a set of attributes](#)



Xiaohui Yu, Calisto Zuzarte, Kenneth C. Sevcik

October 2005 **Proceedings of the 14th ACM international conference on Information and knowledge management CIKM '05**

Publisher: ACM Press

Full text available: [pdf\(269.74 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Accurately and efficiently estimating the number of distinct values for some attribute(s) or sets of attributes in a data set is of critical importance to many database operations, such as query optimization and approximation query answering. Previous work has focused on the estimation of the number of distinct values for a single attribute and most existing work adopts a data sampling approach. This paper addresses the equally important issue of estimating the number of distinct value combinati ...

Keywords: cardinality estimation, relational database

2 [Integration of spatial join algorithms for processing multiple inputs](#)



Nikos Mamoulis, Dimitris Papadias

June 1999 **ACM SIGMOD Record , Proceedings of the 1999 ACM SIGMOD international conference on Management of data SIGMOD '99**, Volume 28 Issue 2

Publisher: ACM Press

Full text available: [pdf\(1.66 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Several techniques that compute the join between two spatial datasets have been proposed during the last decade. Among these methods, some consider existing indices for the joined inputs, while others treat datasets with no index, providing solutions for the case where at least one input comes as an intermediate result of another database operator. In this paper we analyze previous work on spatial joins and propose a novel algorithm, called slot index spatial join (SISJ), t ...

Keywords: query optimization, spatial joins, spatial query processing

3 [Research sessions: statistics: A bi-level Bernoulli scheme for database sampling](#)



Peter J. Haas, Christian König

June 2004 **Proceedings of the 2004 ACM SIGMOD international conference on Management of data**

Publisher: ACM Press

Full text available:  [pdf\(344.80 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#)

Current database sampling methods give the user insufficient control when processing ISO-style sampling queries. To address this problem, we provide a bi-level Bernoulli sampling scheme that combines the row-level and page-level sampling methods currently used in most commercial systems. By adjusting the parameters of the method, the user can systematically trade off processing speed and statistical precision---the appropriate choice of parameter settings becomes a query optimization problem. We ...

4 Fast algorithms for universal quantification in large databases



Goetz Graefe, Richard L. Cole

June 1995 **ACM Transactions on Database Systems (TODS)**, Volume 20 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(3.51 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Universal quantification is not supported directly in most database systems despite the fact that it adds significant power to a system's query processing and inference capabilities, in particular for the analysis of many-to-many relationships and of set-valued attributes. One of the main reasons for this omission has been that universal quantification algorithms and their performance have not been explored for large databases. In this article, we describe and compare three known algorithms ...


5 Space efficient bitmap indexing



Nick Koudas

November 2000 **Proceedings of the ninth international conference on Information and knowledge management**

Publisher: ACM Press

Full text available:  [pdf\(268.42 KB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

6 Advanced SQL modeling in RDBMS



Andrew Witkowski, Srikanth Bellamkonda, Tolga Bozkaya, Nathan Folkert, Abhinav Gupta, John Haydu, Lei Sheng, Sankar Subramanian

March 2005 **ACM Transactions on Database Systems (TODS)**, Volume 30 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(279.06 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Commercial relational database systems lack support for complex business modeling. ANSI SQL cannot treat relations as multidimensional arrays and define multiple, interrelated formulas over them, operations which are needed for business modeling. Relational OLAP (ROLAP) applications have to perform such tasks using joins, SQL Window Functions, complex CASE expressions, and the GROUP BY operator simulating the pivot operation. The designated place in SQL for calculations is the SELECT clause, whi ...

Keywords: Excel, OLAP, analytic computations, spreadsheet


7 Searching in metric spaces with user-defined and approximate distances



Paolo Ciaccia, Marco Patella

December 2002 **ACM Transactions on Database Systems (TODS)**, Volume 27 Issue 4

Publisher: ACM Press

Full text available:  [pdf\(555.89 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Novel database applications, such as multimedia, data mining, e-commerce, and many others, make intensive use of similarity queries in order to retrieve the objects that better fit a user request. Since the effectiveness of such queries improves when the user is allowed to personalize the similarity criterion according to which database objects are evaluated and ranked, the development of access methods able to efficiently support user-defined similarity queries becomes a basic requirement. In t ...

Keywords: Distance metrics, user-defined queries

8 XML indexing and compression: Efficient processing of joins on set-valued attributes



Nikos Mamoulis

June 2003

Proceedings of the 2003 ACM SIGMOD international conference on Management of data

Publisher: ACM Press

Full text available: pdf(678.13 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citings](#), [index terms](#)

Object-oriented and object-relational DBMS support set valued attributes, which are a natural and concise way to model complex information. However, there has been limited research to-date on the evaluation of query operators that apply on sets. In this paper we study the join of two relations on their set-valued attributes. Various join types are considered, namely the set containment, set equality, and set overlap joins. We show that the inverted file, a powerful index for selection queries, c ...

9 Fast joins using join indices

Zhe Li, Kenneth A. Ross

April 1999

The VLDB Journal — The International Journal on Very Large Data Bases, Volume 8 Issue 1

Publisher: Springer-Verlag New York, Inc.

Full text available: pdf(263.06 KB)

Additional Information: [full citation](#), [abstract](#), [index terms](#)

Two new algorithms, "Jive join" and "Slam join," are proposed for computing the join of two relations using a join index. The algorithms are duals: Jive join range-partitions input relation tuple ids and then processes each partition, while Slam join forms ordered runs of input relation tuple ids and then merges the results. Both algorithms make a single sequential pass through each input relation, in addition to one pass through the join index and two passes through a te ...

Keywords: Decision support systems, Query processing

10 Generalized multidimensional data mapping and query processing



Rui Zhang, Panos Kalnis, Beng Chin Ooi, Kian-Lee Tan

September 2005

ACM Transactions on Database Systems (TODS), Volume 30 Issue 3

Publisher: ACM Press

Full text available: pdf(689.08 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Multidimensional data points can be mapped to one-dimensional space to exploit single dimensional indexing structures such as the B^{+} -tree. In this article we present a Generalized structure for data Mapping and query Processing (GiMP), which supports extensible mapping methods and query processing. GiMP can be easily customized to behave like many competent indexing mechanisms for multi-dimensional indexing, such as the UB-Tree, the Pyramid technique, the iMinMax, and the iDistan ...

Keywords: Indexing, data mapping, efficiency

11 Query evaluation techniques for large databases

Goetz Graefe

June 1993 **ACM Computing Surveys (CSUR)**, Volume 25 Issue 2

Publisher: ACM Press

Full text available: pdf(9.37 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Database management systems will continue to manage large data volumes. Thus, efficient algorithms for accessing and manipulating large sets and sequences will be required to provide acceptable performance. The advent of object-oriented and extensible database systems will not solve this problem. On the contrary, modern data models exacerbate the problem: In order to manipulate large sets of complex objects as efficiently as today's database systems manipulate simple records, query-processi ...

Keywords: complex query evaluation plans, dynamic query evaluation plans, extensible database systems, iterators, object-oriented database systems, operator model of parallelization, parallel algorithms, relational database systems, set-matching algorithms, sort-hash duality

12 Research sessions: query progress: Estimating progress of execution for SQL queries

Surajit Chaudhuri, Vivek Narasayya, Ravishankar Ramamurthy

June 2004 **Proceedings of the 2004 ACM SIGMOD international conference on Management of data**

Publisher: ACM Press

Full text available: pdf(201.38 KB)

Additional Information: [full citation](#), [abstract](#), [references](#)

Today's database systems provide little feedback to the user/DBA on how much of a SQL query's execution has been completed. For long running queries, such feedback can be very useful, for example, to help decide whether the query should be terminated or allowed to run to completion. Although the above requirement is easy to express, developing a robust indicator of progress for query execution is challenging. In this paper, we study the above problem and present techniques that can form the basi ...

13 Research papers: OLAP: Efficient computation of multiple group by queries

Zhimin Chen, Vivek Narasayya

June 2005 **Proceedings of the 2005 ACM SIGMOD international conference on Management of data**

Publisher: ACM Press

Full text available: pdf(371.92 KB)

Additional Information: [full citation](#), [abstract](#), [references](#)

Data analysts need to understand the quality of data in the warehouse. This is often done by issuing many Group By queries on the sets of columns of interest. Since the volume of data in these warehouses can be large, and tables in a data warehouse often contain many columns, this analysis typically requires executing a large number of Group By queries, which can be expensive. We show that the performance of today's database systems for such data analysis is inadequate. We also show that the pro ...

14 Research sessions: compression: Wavelet synopses with error guarantees

Minos Garofalakis, Phillip B. Gibbons

June 2002 **Proceedings of the 2002 ACM SIGMOD international conference on Management of data SIGMOD '02**

Publisher: ACM Press

Full text available: pdf(1.44 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Recent work has demonstrated the effectiveness of the wavelet decomposition in reducing large amounts of data to compact sets of wavelet coefficients (termed "wavelet synopses") that can be used to provide fast and reasonably accurate approximate answers to queries. A major criticism of such techniques is that unlike, for example, random sampling, conventional wavelet synopses do not provide informative error guarantees on the accuracy of individual approximate answers. In fact, as this paper de ...

15 Processing queries for first-few answers



Roberto J. Bayardo, Daniel P. Miranker

November 1996 **Proceedings of the fifth international conference on Information and knowledge management**

Publisher: ACM Press

Full text available: pdf(894.67 KB)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

16 Probabilistic wavelet synopses



Minos Garofalakis, Phillip B. Gibbons

March 2004 **ACM Transactions on Database Systems (TODS)**, Volume 29 Issue 1

Publisher: ACM Press

Full text available: pdf(668.62 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Recent work has demonstrated the effectiveness of the wavelet decomposition in reducing large amounts of data to compact sets of wavelet coefficients (termed "wavelet synopses") that can be used to provide fast and reasonably accurate approximate query answers. A major shortcoming of these existing wavelet techniques is that the quality of the approximate answers they provide varies widely, even for identical queries on nearly identical values in distinct parts of the data. As a result, users ha ...

Keywords: Wavelets, approximate query processing, data synopses, randomized rounding

17 On applying hash filters to improving the execution of multi-join queries

Ming-Syan Chen, Hui-I Hsiao, Philip S. Yu

May 1997 **The VLDB Journal — The International Journal on Very Large Data Bases**, Volume 6 Issue 2

Publisher: Springer-Verlag New York, Inc.

Full text available: pdf(318.66 KB)

Additional Information: [full citation](#), [abstract](#), [index terms](#)

In this paper, we explore an approach of interleaving a bushy execution tree with hash filters to improve the execution of multi-join queries. Similar to semi-joins in distributed query processing, hash filters can be applied to eliminate non-matching tuples from joining relations before the execution of a join, thus reducing the join cost. Note that hash filters built in different execution stages of a bushy tree can have different costs and effects. The effect of hash filters is evaluat ed fir ...

Keywords: Bushy trees, Hash filters, Parallel query processing, Sort-merge joins

18 Industrial sessions: big data: Automating physical database design in a parallel database



Jun Rao, Chun Zhang, Nimrod Megiddo, Guy Lohman

June 2002 **Proceedings of the 2002 ACM SIGMOD international conference on Management of data SIGMOD '02**


Publisher: ACM Press

Full text available: pdf(1.38 MB)


Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Physical database design is important for query performance in a shared-nothing parallel database system, in which data is horizontally partitioned among multiple independent nodes. We seek to automate the process of data partitioning. Given a workload of SQL statements, we seek to determine automatically how to partition the base data across multiple nodes to achieve overall optimal (or close to optimal) performance for that workload. Previous attempts use heuristic rules to make those decision ...

19 On parallel execution of multiple pipelined hash joins

 Hui-I Hsiao, Ming-Syan Chen, Philip S. Yu
May 1994 **ACM SIGMOD Record , Proceedings of the 1994 ACM SIGMOD international conference on Management of data SIGMOD '94**, Volume 23 Issue 2

Publisher: ACM Press

Full text available:  [pdf\(1.24 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper we study parallel execution of multiple pipelined hash joins. Specifically, we deal with two issues, processor allocation and the use of hash filters, to improve parallel execution of hash joins. We first present a scheme to transform a bushy execution tree to an allocation tree, where each node denotes a pipeline. Then, processors are allocated to the nodes in the allocation tree based on the concept of synchronous execution time such that inner relations (i.e., hash tables) ...

20 Implementing sorting in database systems

 Goetz Graefe
September 2006 **ACM Computing Surveys (CSUR)**, Volume 38 Issue 3

Publisher: ACM Press

Full text available:  [pdf\(518.63 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Most commercial database systems do (or should) exploit many sorting techniques that are publicly known, but not readily available in the research literature. These techniques improve both sort performance on modern computer systems and the ability to adapt gracefully to resource fluctuations in multiuser operations. This survey collects many of these techniques for easy reference by students, researchers, and product developers. It covers in-memory sorting, disk-based external sorting, and cons ...

Keywords: Key normalization, asynchronous read-ahead, compression, dynamic memory resource allocation, forecasting, graceful degradation, index operations, key conditioning, nested iteration

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Cost Model. A Mixed Transaction Cost Model. Unwalla

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Partitioning and placement. A Mixed Transaction Cost Model. Unwalla

... the possibility that **data skew** makes it impossible to balance partition **cardinality**. ...

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Semantic **Cardinality** Estimation for Mapping and.. - Nodine, Cherniack. ... and data **skew**, we only have to modify the **formula** for **estimating** the ...

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only have to modify the corresponding **formula** accordingly [10]. ... has two attributes A and B. The problem of **estimating** the **cardinality** of R ...

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Or, at what is the minimum **data skew** factor for CIQE to be effective for a ...

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If the optimizer determines that the selectivity, cost, and **cardinality** ... Histograms provide improved selectivity estimates in the presence of **data skew**, ...

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cardinality and memory size. These scalar parameters. are adequate to model a single node system or a parallel. system with no **data skew**. ...
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and assigns to every view identifier an **estimate** of the size of the respective view [9, ...
The **cardinality** of the dimensions in a data set can affect the ...
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forms in the presence of highly skewed **data**. **Skew** in general means that due to the ...
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statistics on the database, including table **cardinality**, ... scope of this paper. Avoid **Data Skew**. When **estimating** new statis- ...

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is resistant to **data skew**. It can also join multiple relations while still ... particular when the **cardinality** of the join index is high. ...

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a **cardinality** is randomly chosen in one of the small, medium or large ranges. ... is severe **data skew** (which yields high variations in ...

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in the presence of **data skew** (see Section 5.4); each thread chooses the ... lots of tuples. a is then equal to the **cardinality** of the pipelined collection. ...

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Consider **data skew**. If a join key involves excessive **data skew**, ... The sample **cardinality** can also be used, in some cases, to **estimate** table **cardinality**. ...

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data flow of each node, it is necessary to **estimate** the sizes of its ... stage, while **estimating** its **cardinality**, in order to make sampling less expensive. ...

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form of **cardinality** constraints (such as existence and func- ... sary for **estimating** the result of a semi-join is the semi-join. selectivity of a predicate, ...

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a lot of false positives due to **data skew** present in the various dataset partitions ...

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The reason is that the **estimate** of the task time for HJ* becomes very. difficult: A high skew value for one relation the join output **cardinality** ...

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7 Also, note that on average (assuming little or no **data skew**), ... one or more dimensions to a coarser granularity in order to give it a lower **cardinality**. ...

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with their **cardinality** and the minimum and maximum sizes of the ... mining on streams when the **data skew** between different incoming blocks is high. ...

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The large groups were caused by **data skew**. For example, there were only 114 tuples

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Given f and T ?, we can derive using bayesian reasoninga **formula** for. $fi(q,s,T ?)$. This is a key technical result ofthis paper since in this **formula** lies ...

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This value is INSTANCES in the **formula**. **Estimate** the maximum number of ...

Furthermore, this can lead to **data skew** during the execution if you do not ...

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Now, assume that you have a join key with high **cardinality**, but one of the values ...

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To avoid **data skew** among partitions. Hash partitioning is an effective means of ...

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the **estimate** has over 2000% relative error! Likewise, d ... value of **data skew**, our

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data skew problems. We selected maxdiff histogram method with sampling by ... selectivities for sample values and then **estimate cardinality** for whole table. ...

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taken from the set $\{1, \dots, y\}$ and having **cardinality** z : ... **formula** for s it follows that $m \cdot b = s$, thus $m = s/b$. Consider now the vector ...

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algorithm relies on three basic operations: (1) **Estimating** the ... produces tight error bounds for such a large **data skew** value and for small data ...

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application development world, there is not a simple formula for the ... information about **data skew** and column **cardinality** becomes critically important ...

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w (output **cardinality** - OC) is estimated by the following formula: ... lems due to **data skew**. Another direction for future work is the study of alternative ...

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For most installations , this number will be 1 . This value is INSTANCES in the **formula**

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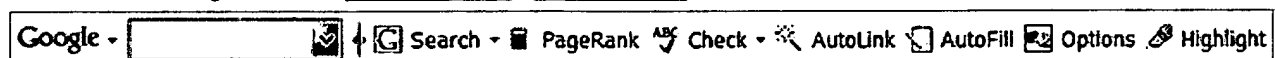
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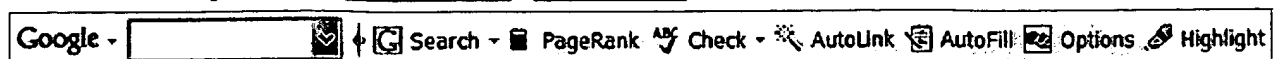
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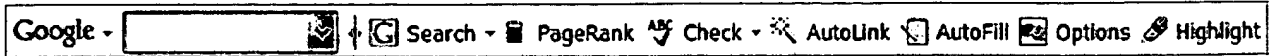
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